

display underlying depressive and anxiety states causing them to over-react to daily and anticipated future stressors. In addition, in this study it was observed that neglect of OH was associated with depression and anxiety states due to reduced personal care, but in depression a lack of focus was the underlying cause, while in the latter it was usually due to a lack of concentration.

A large body of research has reported that stress can have profound influences on body function, and also on the body's susceptibility to disease, as well as its ability to heal itself, although the exact processes by which this occurs are difficult to define. Several workers (3,4) have described what they term "The Psychophysiological Reactivity Model". In their research, they described direct and indirect effects of stress. The direct effects resulted in alterations in basal immune status (clinically appearing as reduced compliance and home care [seen as increased levels of dental plaque]), whereas indirect effects resulted in changes in reactivity to stressors (due to CNS/neuro-endocrine stimulation resulting in changes in immunity responses). They observed that raised physiological reactivity to perceived stress was what affected the immune system. In this model, the response is not due to the presence of stress itself, as most people are subjected to stresses in many forms throughout their lives. It was much more a matter of how well individuals coped with the stresses to which they were subjected.

Somewhat frustratingly, other research has shown that perceived stress, depression and anxiety states do not necessarily significantly correlate with plaque accumulation. For example, in a multiple regression analysis using plaque as a dependant variable and psycho-social factors as the independent variable, no relationships could be found. However, other studies contradict this finding and have shown a statistically significant correlation between depression and plaque levels. It has also been shown that anxiety states may enhance the gingival inflammatory response (5).

Another model called the "psychosomatic vulnerability model" holds that raised physiological reactivity to perceived stress affects the immune system, especially during negative life events and in the presence of occupational stress factors (6, 7).

Psychological factors (measured by the well established "Holmes & Rahe (1967) Social Rating Scale") in the social environment (like marital status, employment status, domestic stability, severe illness and changes in these factors) has been shown to lead to stress, which then impacts upon the psychological process resulting in raised disease susceptibility (8). This study demonstrated that unemployment had the strongest correlation with increased periodontitis, tobacco smoking and poor oral hygiene. It was concluded that periodontitis is associated with negative impact life events, while positive impact life events are associated with better periodontal health states (8).

In another study, psycho-social factors associated with financial

strain and distress manifest in depression and are significant indicators of future severe periodontal disease in adults. However, those individuals who had high levels of financial strain but who had reported high levels of problem-based coping mechanisms as opposed to emotion-based coping mechanisms had no more periodontal disease than those with low periodontal disease (9).

A pessimistic outlook (which is said to be a characteristic of depression) has been shown to increase susceptibility to a number of physical illnesses (10). Conversely, it was also shown that overall stability in psychological variables was associated with better reductions in clinical variables (10).

Changes in physiology during periods of stress

Although the exact mechanisms of the interaction between stress and periodontal diseases are unknown, changes to the physiological processes of the body are known to occur at times of stress. Increased secretion of neurotransmitters, such as noradrenaline, and increased cholesterol production have profound effects on many physiological processes in the body. "Disorder" (in the sense of uncontrolled or out of balance) has been shown to arise from poor regulation of the immune system leading to hyperfunctional or hypofunctional inflammatory disorders that result in discomfort and decreasing performance (11). More specifically to the initiation of periodontal diseases, it has been reported that stress (of exams in medical students) increases intracrevicular Interleucine secretion in response to supra gingival dental plaque (12).

Physiological changes arising out of emotional stress

- Modification of dietary intake in terms of regular meals, and increase in consumption of high sugar containing foods such as confectionery, sweets, etc.
- Neglect of meticulous oral hygiene maintenance as part of a reduction in general personal care.
- Increased nicotine exposure in smokers. This leads to increased vasoconstriction in gingival tissues with reduced O₂ and nutrient availability to periodontal tissues.
- Changes in salivary pH.
- Glucocorticoids (such as cholesterol) are released under stress, and these substances alter the responses of oral tissues to bacteria, depress polymorphonucleocyte chemotaxis and phagocytosis, and reduce lymphocyte proliferation on stimulation by irritants.

It is known that noradrenaline has a close association with stress-